

Reducing Personal Vehicle Kilometers Travelled to Reduce Air Pollution in Durham, NC

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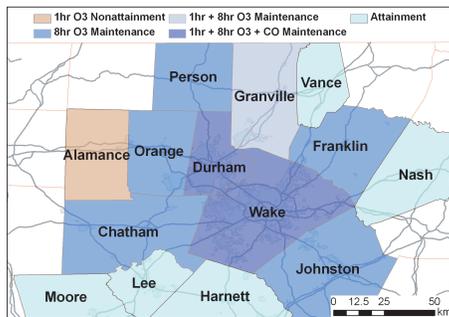
Introduction

The Research Triangle is a region in central North Carolina that encompasses Raleigh, Durham, Chapel Hill and the surrounding developed areas (including Cary, Apex, Carrboro, and Hillsborough). Over the past few decades this region has been experiencing huge growth in population and development, similar to what is occurring in other southern cities. Due to factors to be discussed later, this area is particularly prone to sprawling development and has a transportation network that promotes sprawling development and automobile dependence. The latter is a particular issue in the context of increases in air pollution, both in relation to criteria air pollutants and green house gasses (GHGs). Planners and policies makers have no short term plans to bring forth a system that is less car dependent, meaning we would expect to see rising annual air pollution rates in the near term future. This research hopes to examine ways in which regional organizations can encourage commuters to undertake actions in the short term (5 years) in order to reduce auto pollution.

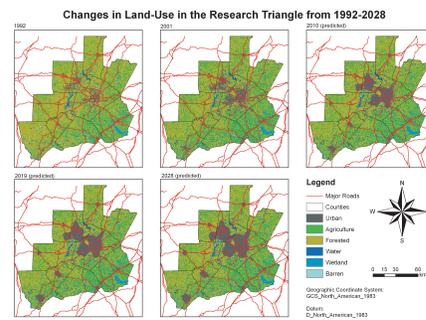
Methods & Data

- 1+ Review the literature on regional geographical, political and economic issues.
- 2+ Examine trends occurring in basic census, regional employment, and other datum.
- 3+ Develop a model, based on a logit regression as presented in a paper by Bolstad et al. and USGS LULC maps, to project urban growth trends in the region.
- 4+ Employ DraftMOVES2009, in conjunction with data sets from various regional organizations, to determine baseline emissions levels in the region.
- 5+ Regress the data points from the air quality model to create functions for changes in pollution due to changes in VKTs.
- 6+ Read the literature on travel mode choices to choose appropriate reduction mechanisms.
- 7+ Conduct a CV survey to explore local resident's attitudes towards alternative commuting and determine their Willingness to Accept an alternative commute.
- 8+ Perform a statistical analysis using a log transformed bid in a logit regression to develop a travel mode choice model based on discrete choice.
- 9+ Extrapolate those results to the region as a whole to determine costs associated with each reduction method.
- 10+ Determine the resulting VKT reductions for the populations of Duke and Durham SOV drivers.

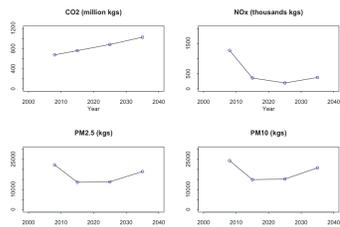
Results



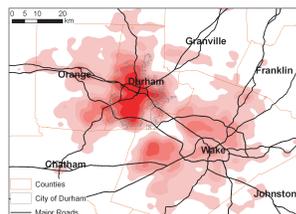
As of now 14 counties are being considered as part of the region. 10 of these make up the Triangle J Council of Governments, a regional political organization. Person and Alamance county were included due to the high level of commuters they send to the region. Of these counties only Alamance is in CAA nonattainment, though many are in maintenance status and will potentially return to nonattainment due to the 2010 ozone rule.



The map to the right shows how development could occur based on a model developed by Bolstad et al. The logit regression used in the model found that proximity to urban areas, presence of wetlands, presence of agricultural or barren land, slope, elevation, distance to a road and distance to an interstate were all significant. One would notice that the growth is centralized in areas with already higher levels of development.



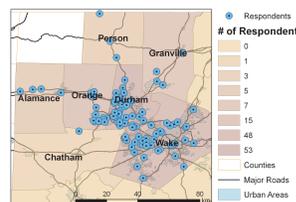
The graphs to the left exhibit the trends in baseline emissions and the impact of changes on VKTs on emissions for light duty vehicles as predicted by DraftMOVES2009 for the City of Durham. No changes in technology were considered in this analysis. Data was from local sources, except average speed distributions and fuel supply which were from the defaults. The results were regressed to create simplified reduction formulas.



The map to the left shows commuted data obtained from OnTheMap for the city of Durham. It is clear, especially from the inserts, that the majority of commutes to each city either originate in census blocks that are either within the incorporated city's boundaries or nearby. This result could prove beneficial for the increases in the mode choice of alternative transit. This data will later be incorporated into the soon to be developed mode choice model.



The mode choices examined were walking, bicycling, bussing, carpooling, and vanpooling. To determine people's mode preference, they were surveyed using an email survey instrument, the crux of which was dichotomous choice model concerning each mode choice. They were asked if they would take said mode for a random dollar value.



In total, 209 out of 452 members of the sample responded to the survey. Of the responses 121 were usable. Of these 20% of the respondents did not accept any alternative mode of transit at the bid value provided. Overall the responses reflect expected behavior and matched the commute shed (as can be seen in the map to the left). Further details concerning the results are available upon contact.

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